



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 29 1994

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Transmittal of Science Chapter for Difenconazole.
New Chemical, Proposed Use: Seed Treatment for
Wheat and Barley

FROM: *for* Anthony F. Maciorowski, Chief, *Douglas J. Urban*
Ecological Effects Branch/EFED (H7507C)

TO: Cynthia Gile-Parker, Product Manager #22
Registration Division (H7505C)

Please find attached said document in response to Barcode registration actions: D194836, D194830, 194874 and D194874. It is hoped that this science chapter is fully responsive. You may feel free to call Robert Hitch (305-5991) on my staff for more information.

Summary of Risk.

The toxicity and exposure data available at this time indicate no significant risk from the use of this chemical. We will quickly add that there is a problem in that there is no known route of degradation for this compound. The Environmental Fate and Groundwater Branch requires only hydrolysis studies for seed treatment chemicals. Because difenconazole was found to not hydrolyze, there is no known route of degradation for this compound. This greatly increases the hazard due to possible spills because we do not know whether this material will persist in the environment. It is highly toxic to aquatic organisms. We recommend that fate data be provided to elucidate degradation of this compound in natural waters before large scale uses are granted.



2071204

DC Barcode : D194836 &
D194830, D194872,
& D194874

PC Code No :128847

EEB Out :

To: Cynthia Giles-Parker
Product Manager #22
Registration Division H7505C

From: Anthony F. Maciorowski, Chief
Ecological Effects Branch/EFED (H7507C)

Attached, please find the EEB review of...

Reg./File # : _____
Chemical Name : Difenoconazole
Type Product : Fungicide for seed treatment use
Product Name : Dividend
Company Name : Ciba Geigy Corporation
Purpose : Science Chapter for new chemical
Action Code : 100 Date Due : 5/28/94
Reviewer : R. Hitch Date In EEB: 9-14-93
EFGWB NOTE: Please see request for elucidation of degradation rate
in Risk Section.

EEB Guideline/MRID Summary Table: The review in this package contains an evaluation of the following:

GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT
71-1(A)	422451-05	Y	72-2(A)	422451-10	Y	72-7(A)		
71-1(B)			73-3(A)	429067-02	Y	72-7(B)		
71-2(A)	422451-03	Y	72-3(A)	422451-12	Y	122-1(A)		
71-2(B)	422451-04	Y	72-3(B)	422451-13	Y	122-1(B)		
71-3			72-3(B)	429067-01	Y	122-2		
71-4(A)	422806-01	S	72-3(B)	422451-13	Y	123-1(A)		
71-4(B)	422451-06	S	72-3(C)	422451-11	Y	123-1(B)		
71-5(A)			72-3(F)			123-2		
71-5(B)			72-4(A)	422451-15	S	141-1	422451-23	S
72-1(A)	422451-09	Y	72-4(B)	422451-14	S	141-1	422451-24	Y
72-1(C)	422451-07	Y	72-5			141-1		
72-1(C)	422451-08	Y	72-6			141-2		
72-1(D)						141-5		

Y=Acceptable (Study satisfied Guideline)/Concur

P=Partial (Study partially fulfilled Guideline but
additional information is needed)

S=Supplemental (Study provided useful information but Guideline was
not satisfied)

N=Unacceptable (Study was rejected)/Nonconcur

ECOLOGICAL EFFECTS BRANCH
SCIENCE CHAPTER FOR DIFENOCONAZOLE

A. Ecological Hazard

1. Topical Summaries

a. Hazard to Non-Target Birds

In order to establish the toxicity of difenoconazole to birds, the following tests are required using the technical grade material: One single-dose oral study with one species (preferably either mallard duck or bobwhite quail) and two subacute dietary studies; One of the subacute dietary studies shall be conducted with an upland game bird (preferably bobwhite quail) and the other shall be conducted with a species of waterfowl (preferably the mallard duck). Additionally two avian reproduction studies are required--preferably with the bobwhite quail and mallard duck.

The following acute oral toxicity test is acceptable for use in hazard assessment:

Gdln	Test Species	T.M.	Test Results	MRID	Fulfills Req.
71-1(a)	Mallard	96.1%	LD50 > 2150 mg/kg	422451-05	Yes

The guideline requirement (71-1) for an avian acute oral study has been satisfied. Difenoconazole is characterized as practically non-toxic to birds.

The following dietary toxicity tests are acceptable for use in a hazard assessment:

Gdln	Test Species	T.M.	Test Results	MRID	Fulfills Req.
71-2a	Bobwhite	95.2%	LC50 = 4760 ppm	422451-03	Yes
71-2b	Mallard	94.7%	LC50 > 5000 ppm	422451-04	Yes

The guideline requirement (71-2) for avian dietary studies has been satisfied. Difenoconazole is characterized as slightly toxic to practically nontoxic.

The following avian reproduction studies were reviewed:

Gdln	Test Species	T.M.	Test Results	MRID	Fulfills Req.
71-4(a)	Bobwhite	91.9%	NOEC = 125 ppm	422806-01	No
71-4(b)	Mallard	91.9%	NOEC = 125 ppm	422451-06	Partially

The guideline requirement (71-4) for avian reproduction studies has not been satisfied. For MRID 422806-01 there was unexplained adult mortality in several treatment levels negating the ability to derive treatment related effects. For MRID 422451-06 some pen data were missing however, it does provide useful information for assessing chronic risk to birds.

For the seed treatment use, the value of repeating either of these studies is low since chronic exposure to birds is not expected. For future registrations, one or both of the avian reproduction studies may need to be repeated.

b. Hazard to Non-Target Freshwater Fish

The minimum data requirements for establishing the acute toxicity to fish are the results from two 96-hour studies with the technical grade material. The studies are to be performed on one coldwater species (preferably rainbow trout) and one warmwater species (preferably bluegill sunfish). The following are acceptable acute toxicity studies:

Gdln	Test Species	T.M.	96 Hr LC50 Test Results	MRID	Fulfills Req.
72-1a	Bluegill	96.1%	0.52 mg/l	422451-09	Yes
72-1c	Trout (<u>Salmo gairneri</u>)	96.1%	1.1 mg/l	422451-08	Yes
72-1c	Trout (<u>Onchoryncus mykiss</u>)	96%	0.35 mg/l	422451-07	Yes

The guideline requirement (72-1) for acute fish toxicity studies has been satisfied. Difenoconazole is characterized as moderately to highly toxic.

The minimum requirement with regard to chronic fish toxicity studies is one early life stage study. The following study was reviewed:

Gdln	Test Species	T.M.	96 Hr LC50 Test Results	MRID	Fulfills Req.
72-4a	Fathead minnow	94.8%	NOEL > 8.7 ug/l	422451-15	No

The requirement for a chronic fish study (72-4a) is not filled. In MRID 422451-15 the relative standard deviation for fish weight in one of the control replicates was unacceptable (53%) and control contamination was observed in two replicates. These problems prohibited deriving useful dose response information.

The value of information for repeating this fish early life stage for the seed treatment use is medium. The potential for aquatic exposure is generally low, however, if any difenoconazole did reach aquatic habitats, it might be persistent. Without valid chronic fish data, the EEB would be unable to characterize the risk represented by such exposure.

For future proposed uses, this study may be required.

c. Hazard to Non-Target Freshwater Aquatic Invertebrates

Gdln	Test Species	T.M.	48 hr EC50 Test Results	MRID	Fulfills Req.
72-2a	<u>Daphnia magna</u>	96.1%	0.77 mg/l	422451-10	Yes

The guideline requirement (72-2a) for an acute freshwater invertebrate toxicity study is satisfied. Difenoconazole is characterized as highly toxic.

The minimum requirement for chronic freshwater invertebrate studies is one life cycle study. The following life cycle study was reviewed:

Gdln	Test Species	T.M.	96 Hr LC50 Test Results	MRID	Fulfills Req.
72-4b	<u>Daphnia magna</u>	96.1%	MATC > 5.6 ug/l and < 13 ug/l	422451-14	No

The requirement for a freshwater invertebrate life-cycle study (72-4) is not filled because daphnid weight was not measured in 422451-14.

The value of information for repeating this aquatic invertebrate life cycle study for the seed treatment use is medium. The potential for aquatic exposure is generally low, however, if any difenoconazole did reach aquatic habitats, it might be persistent. Without valid chronic aquatic invertebrate fish data, the EEB would be unable to characterize the risk represented by such exposure.

For future proposed uses, this study may be required.

d. Hazard to Non-Target Estuarine and Marine Organisms (Fish, Shrimp, and Mollusks)

Gdln.	Test Species	T.M.	Test Results	MRID	Fills Gdln Req.
72-3a	Sheepshead minnow	96.1%	96 hr LC50 819 ug/l	422451-12	Yes
72-3a	Sheepshead minnow	96%	96 hr LC50 1.1 mg/l	429067-02	Yes
72-3b	Eastern Oyster	96%	96 hr shell Deposition EC50>424 ug/l	429067-01	Yes
72-3b	Eastern Oyster	95%	96 hr shell Deposition EC50>300 ug/l	422451-13	Yes
72-3c	Mysid shrimp (Mysidopsis bahia)	95%	96 hr LC50 48 ug/l	422451-11	Yes

The 72-3 guideline requirements are filled by the studies above. Difenaconazole is characterized as highly toxic.

e. Hazard to Non-Target Insects (beneficial insects)

Gdln	Test Species	T.M.	Test Results	MRID	Fulfills Req.
141-1	Bee (<u>Apis mellifera</u>)	91.1%	48 hr contact LD50 100 ug/bee	422451-24	Yes
141-1	Bee (<u>Apis mellifera</u>)	91.8%	48 hr contact LD50 > 101 ug/bee 48 hr oral LD50> 177 ug/bee	422451-23	No

The guideline requirement (141-1) for an acute contact study with the honey bee is satisfied. Difenaconazole is characterized as

relatively non-toxic to honey bees.

f. Hazard to Non-Target Plants

No studies of plant toxicity have been submitted at this time. Because difenaconazole is a fungicide, it may be assumed to be nonhazardous to terrestrial plants. Fungicides may be toxic to certain aquatic plants, and aquatic plant data may be required for future uses. However, potential for aquatic exposure from the seed treatment use is minimal so aquatic plant testing is not required at this time.

2. Disciplinary Review

The Ecological Effects Branch uses the lowest valid toxicity values in assessing risk. For difenaconazole, we will specifically utilize the avian LC50 which was 4760 ppm (MRID 422451-03) for the bobwhite quail.

For the risk to fish, we will use the trout, Onchorhynchus mykiss, LC50 of 0.351 mg/l (MRID 422451-07). Further we will use MRID 422451-24 which demonstrated that bee contact LD50 was greater than 100 ug/bee.

For the risk to freshwater invertebrates, the Daphnia magna EC50 of 0.77 mg/l will be used. Risk to estuarine invertebrates shall be based on the 96 hr EC for the Eastern oyster of 180 ug/l (MRID 429067-01).

B. Ecological Effects Risk Assessment

1. Use Profile. Difenconazole is applied to wheat and barley seed. The maximum application rate for wheat seed is one fluid ounce of product per 100 pounds of seed and the barley seed maximum rate is one half ounce per 100 pounds for barley. The product is 3 lbs of active ingredient per gallon resulting in a maximum residue on wheat seed 230 ppm. The barley seed residue would be 115 ppm or one-half of the maximum wheat seed residue.

If we assume that farmers typically sow around 50 pounds of wheat seed per acre we can estimate a residue in soil. The 50 pounds of seed would contain 0.010 lb of active ingredient if one follows the maximum label rate. There are about 40,000 square feet in an acre so the application rate is 0.010 lb. /40000 sq. ft., or, approximately 0.25 millionths of an ounce per square foot. Soil typically weighs about 80 pounds per cubic foot. We will assume that the difenconazole stays in the top four inches. A soil section 4" by 1" by 12" will weigh about 23 pounds. Therefore, in the top four inches of soil, we would expect a residue of about 10 ppb (0.25×10^{-6} lbs a.i. / 23 lbs soil).

2. Environmental Fate Profile

Water solubility-- 3.3g/l in Water (20°C)

Hydrolysis rates-- Stable to hydrolysis at pH 5, 7, or 9.

Vapor Pressure 2.5×10^{-10} mm Hg.

3. Risk Assessment

Summary of Risk.

The toxicity and exposure data available at this time indicate no significant risk from the use of this chemical. We will quickly add that there is a problem in that there is no known route of degradation for this compound. The Environmental Fate and Groundwater Branch requires only hydrolysis studies for seed treatment chemicals. Because difenconazole was found to not hydrolyze, there is no known route of degradation for this compound. This greatly increases the hazard due to possible spills because we do not know whether this material will persist in the environment. It is highly toxic to aquatic organisms. We recommend that fate data be provided to elucidate degradation of this compound in natural waters before large scale uses are granted.

a. Non-endangered species

Risk to Aquatic Organisms

We do not expect impact to aquatic organisms from the use of difenoconazole because the treated seed will be incorporated. In the case of an **accidental spill** to surface water the high toxicity of difenoconazole to aquatic organisms and its high solubility and low rate of hydrolysis could cause impact. A spill of one 55 gallon drum of the product could theoretically contaminate a 60 million gallon lake with the LC50 for the trout, Onchorynchus mykiss. (Based on 55 gallon drum weighing approximately 520 pounds and consisting of about 32.8 % active as accepted by EPA 6-11-93 for the product known as Dividend).

Risk to Terrestrial Organisms

An earthworm study utilizing 14 days of exposure was submitted voluntarily by the registrant. It has not been evaluated by the Agency since it is a nonguideline study. The study results indicate that the LC50 is greater than 600 ppm. During a pilot study 100 percent mortality was observed at 1000 ppm. Even if we took the LC50 to be 600 ppm, it is thousands of times larger than the projected residue in soil of 10 ppb. No acute hazard is projected for earthworms.

For terrestrial birds, the criteria for high risk concern is 1/2 the LC50 (Neither of the two avian reproduction studies were acceptable). The LC50 was 4760 ppm for the bobwhite (MRID 422451-03) making the criteria risk criteria 2380 ppm. Because the highest residues on seeds are 230 ppm, no acute risk is projected for birds. The avian no observable effect concentration was 125 ppm for bobwhite quail and mallard duck (MRID's 422806-01 and 422451-06) however a chronic avian exposure to difenoconazole would not be expected, because, once seed germination has occurred, the concentrated pesticide would be dispersed either to the wheat seedling or the soil. Dr. Blair Goates (1-208-397-4181) with the USDA in Aberdeen, Idaho notes that germination of the wheat should occur within about two weeks of sowing.

In Tox Branch studies, no deaths occurred among rats exposed to 10,000 ppm for 28 days so concern for foraging mice and other small mammals is minimized.

b. Endangered Species. Although many endangered species exist within the wheat and barley growing area, no impact is expected from difenoconazole use. Endangered birds which would have been the most likely to have been impacted have an LOC of 0.1. That is, if the exposure divided by the LC50 equals or exceed 0.1 we assume that endangered birds may be affected. Since the lowest LC50 is 4760 (MRID 22451-3) we would therefore have concern if the exposure exceeded 476 ppm. However, the highest projected residue is 230

ppm. This yields a risk quotient of 0.04; well below the LOC of 0.1. Chronic avian exposure is not expected due to the method of application.

No risk to endangered aquatic species is expected due to the seed treatment use. Most of the difenoconazole will be incorporated in the soil with the seed and thus the pesticide will not be available to be swept off the land by water flow.

1. Manufacturing Use (Technical)

"This pesticide is toxic to fish and aquatic invertebrates. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or public waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA."

2. End Use

This product is toxic to fish and aquatic invertebrates. For terrestrial uses, do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment, wash waters or rinsates.

D. Data Requirements (also see Data Table attached).

The only data requirements currently outstanding are for the avian reproduction (71-4A and 71-4B), the fish early life stage (72-4A) studies, and the daphnia life cycle (72-4b).

The avian reproduction studies would provide low value added because chronic exposure to avian species is not expected with this use pattern. The growth of the wheat and barley seedlings should disperse the pesticide and greatly dilute any dietary exposure.

Currently we do not know how persistent difenoconazole is in the aquatic environment. We must, therefore, presume that it is persistent. However, as was stated earlier, the potential for difenoconazole reaching surface water is low, so widespread exposure to aquatic organisms is not expected. This gives a low value added to daphnia life-cycle and fish early life stage studies. These studies are not required for the seed treatment use. For future proposed uses which may involve greater potential for chronic exposure to birds and aquatic organisms, these chronic tests may be required. In addition, future uses may trigger testing on two species of aquatic plants including *Lemna gibba* and *Selenastrum capricornutum*.

Date: March 1994
Case No:
Chemical No: Difenconazole 128847

PHASE IV
DATA REQUIREMENTS FOR
ECOLOGICAL EFFECTS BRANCH

Data Requirements	Composition ¹	Use Pattern ²	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
6 Basic Studies in Bold					
71-1(a) Acute Avian Oral, Quail/Duck	TGAI	A	Yes	422451-05	No
71-1(b) Acute Avian Oral, Quail/Duck	(TEP)				
71-2(a) Acute Avian Diet, Quail	TGAI		Yes	422451-03	No
71-2(b) Acute Avian Diet, Duck	TGAI		Yes	422451-04	No
71-3 Wild Mammal Toxicity					
71-4(a) Avian Reproduction Quail	TGAI		No	422806-01 ³	See footnote ⁴
71-4(b) Avian Reproduction Duck			No	422451-06 ³	See footnote ⁶
71-5(a) Simulated Terrestrial Field Study					
71-5(b) Actual Terrestrial Field Study					
72-1(a) Acute Fish Toxicity Bluegill	TGAI		Yes	422451-09	No
72-1(b) Acute Fish Toxicity Bluegill	(TEP)				
72-1(c) Acute Fish Toxicity Rainbow Trout	TGAI		Yes	422451-08 & 422451-07 were acceptable	No
72-1(d) Acute Fish Toxicity Rainbow Trout	(TEP)				
72-2(a) Acute Aquatic Invertebrate Toxicity	TGAI		Yes	422451-10	No
72-2(b) Acute Aquatic Invertebrate Toxicity	(TEP)				
72-3(a) Acute Estu/Mari Tox Fish	TGAI		Yes	422451-12 and 429067-02 were acceptable	No
72-3(b) Acute Estu/Mari Tox Mollusk	TGAI		Yes	429067-01 and 422451-13 were acceptable	No
72-3(c) Acute Estu.Mari Tox Shrimp	TGAI		Yes	422451-11	No

* In Bibliographic Citation column 1 indicates study may be upgradeable

Date: March 1994
Case No:
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PHASE IV
DATA REQUIREMENTS FOR
ECOLOGICAL EFFECTS BRANCH

Data Requirements	Composition ¹	Use Pattern ²	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
72-3(d) Acute Estu/Mari Tox Fish	(TEP)				
72-3(e) Acute Estu/Mari Tox Mollusk	(TEP)				
72-3(f) Acute Estu/Mari Tox Shrimp	(TEP)				
72-4(a) Early Life-Stage Fish	TGAI		No	422451-15 ⁷	See footnote ⁸
72-4(b) Live-Cycle Aquatic Invertebrate	TGAI		No	422451-14 ⁹	See footnote ¹⁰
72-5 Life-Cycle Fish					
72-6 Aquatic Org. Accumulation					
72-7(a) Simulated Aquatic Field Study					
72-7(b) Actual Aquatic Field Study					
122-1(a) Seed Germ./Seedling Emerg.					
122-1(a) Seed Germ./Seedling Emerg.					
122-1(b) Vegetative Vigor					
122-2 Aquatic Plant Growth	TGAI		No		No ¹¹
123-1(a) Seed Germ./Seedling Emerg.					
123-1(b) Vegetative Vigor					
123-2 Aquatic Plant Growth					
124-1 Terrestrial Field Study					
124-2 Aquatic Field Study					
141-1 Honey Bee Acute Contact			Yes	422451-24 (acceptable) and 422451-23 (unacceptable)	No
141-2 Honey Bee Residue on Foliage					
141-5 Field Test for Pollinators					

* In Bibliographic Citation column 1 indicates study may be upgradeable

1. Composition: TGAI=Technical grade of the active ingredient; PAIRA=Pure active ingredient, radiolabeled; TEP=Typical end-use product

2. Use Patterns: A=Terrestrial Food Crop; B=Terrestrial Feed Crop; C=Terrestrial Non-Food Crop; D=Aquatic Food Crop; E=Aquatic Non-Food Outdoor; F=Aquatic Non-Food Industrial; G=Aquatic Non-Food Residential; H=Greenhouse Food Crop; I=Greenhouse Non-Food Crop; J=Forestry; K=Outdoor Residential; L=Indoor Food; M=Indoor Non-Food; N=Indoor Medical; O=Indoor Residential; Z=Use Group for Site 00000

3. There was unexplained adult mortality in several treatment levels negating the ability to derive treatment related effects.

4. This study does not need to be repeated for this seed treatment use.

5. Some pen data were missing however, it does provide useful information for assessing chronic risk to birds.

6. This study does not need to be repeated for this seed treatment use.

7. Because of high relative standard deviation in weight in one control and because of contamination with difenoconazole in other control replicates, MRID 422451-15 was judged to be unacceptable.

8. This study is not required for seed treatment use.

9. The daphnid weight was not measured, thus neglecting one valuable endpoint in determining potential chronic adverse effects to invertebrates. The value for repeating this study is low since difenoconazole is unlikely to reach aquatic habitat.

10. This study is not required for seed treatment use.

11. Aquatic plant testing is not required for the seed treatment use. However, future uses may trigger the need for two Tier I aquatic plant studies with *Lemna gibba* & *Selenastrum capricornutum*.